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# Watershed Approach/Case Study for Storm Water Management at Los Alamos National Laboratory

**William Foley**

November 9, 2018



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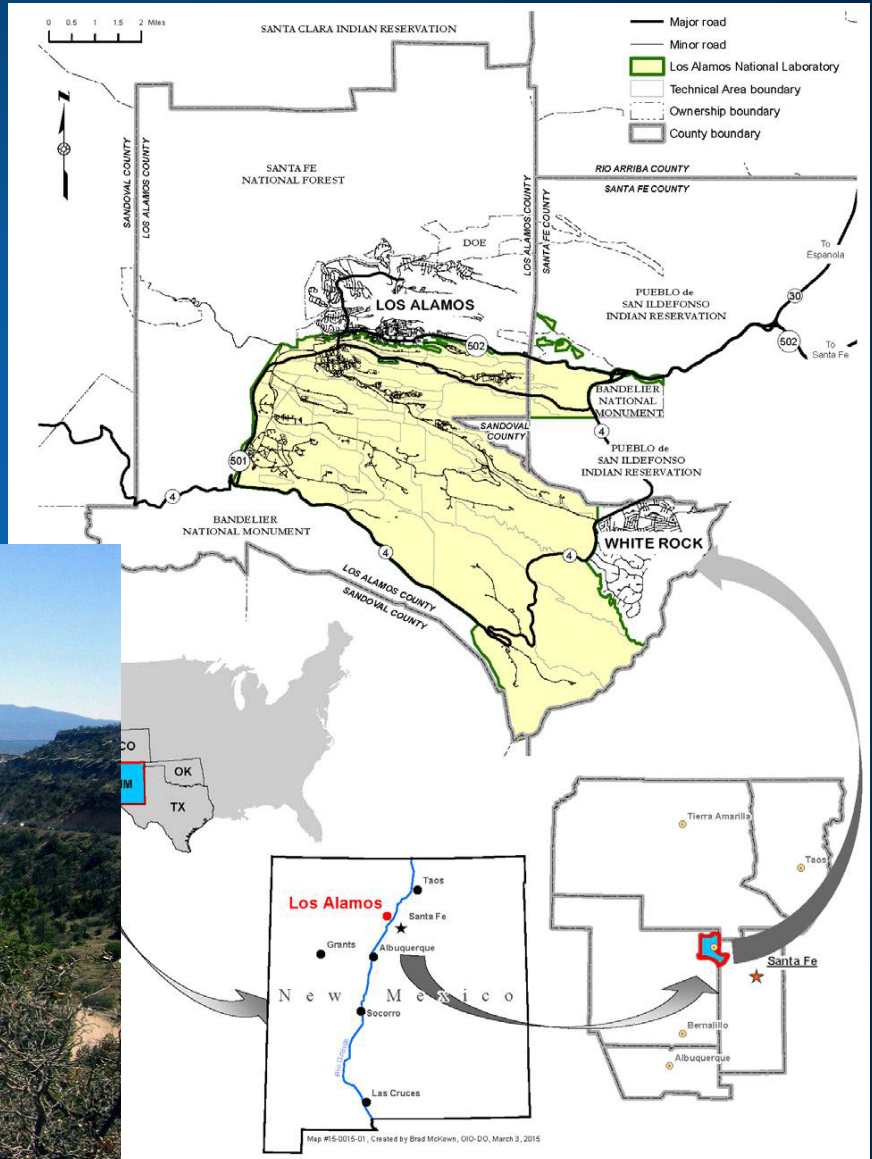
# Introduction



- **Location Setting**
- **Historical Storm Water Management**
- **Recent History and Subsequent Responses Related to Storm Water**
  - Cerro Grande Fire
  - Los Conches Fire
  - 2013 Flood Event
- **Current Developing Approach to Storm Water Management**
  - Holistic Approach
  - Watershed Controls
- **Watershed Case Study**

# Location Setting

- Los Alamos National Laboratory established 1943
- 47 Technical Areas
- ~10,000 employees
- Situated on Pajarito Plateau
- 36 sq. mi.



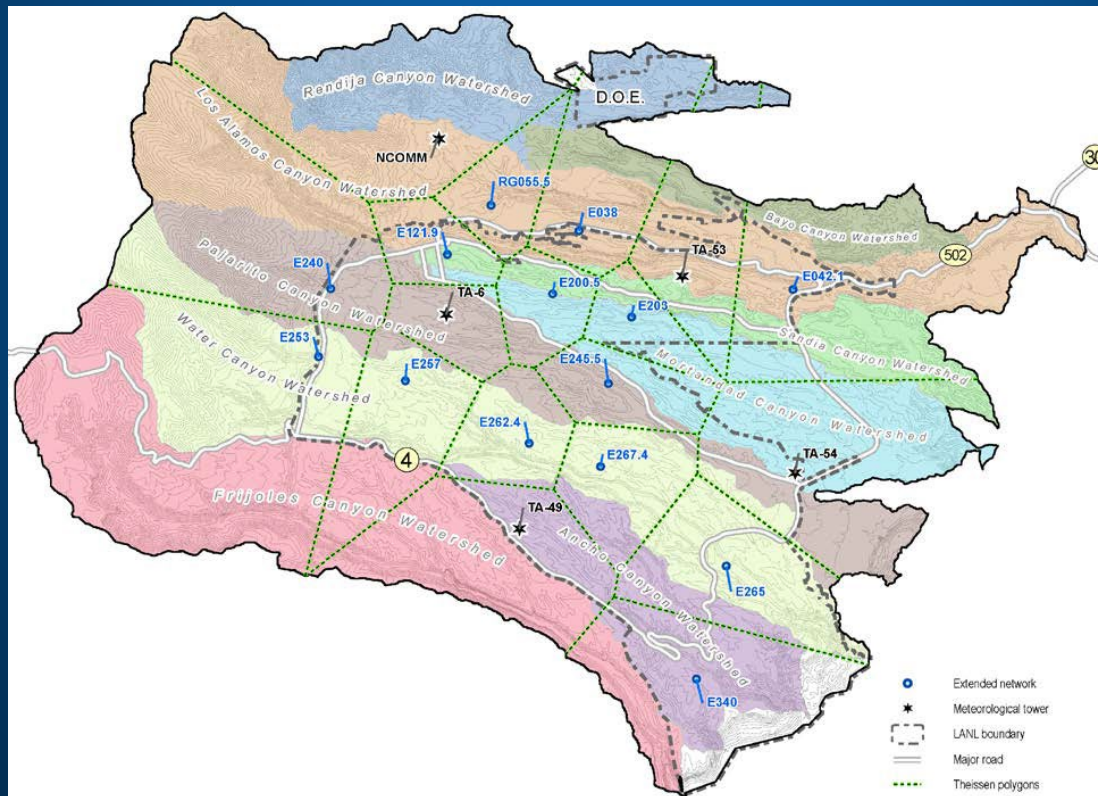
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# Location Setting

- **Rainfall characteristics**
  - Variation from west (19-in) to east (16-in)
  - Variation based on proximity to ridgelines/mesa tops/canyon bottoms
  - 45% of rainfall between July - September
- **Met towers vs. extended network**



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# Location Setting

- Surface Water Flow Characteristics
- Flow Gages



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# Historical Storm Water Management (pre 2000)

- **Content**

- Traditional design elements
- Watershed controls



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# Recent History and Subsequent Responses Related to Storm Water

- **Cerro Grande Fire**

- May 2000
- 48,000 acres
- Increased flooding concerns
- Increased sediment transport concerns
- Flood Controls





# Recent History and Subsequent Responses Related to Storm Water

- **Cerro Grande Fire**

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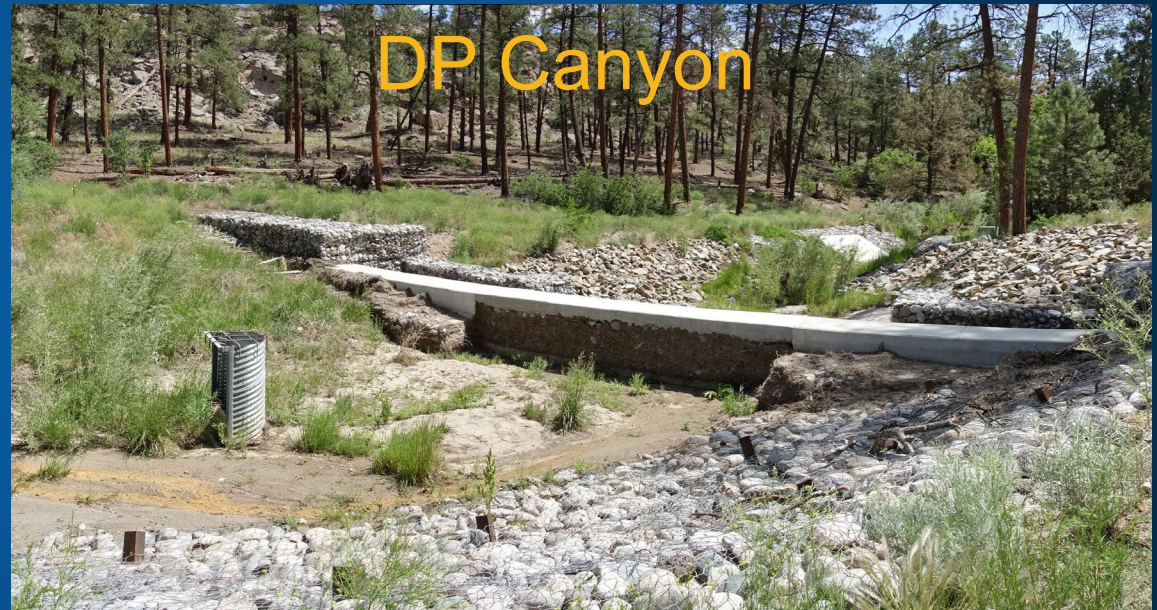
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# Recent History and Subsequent Responses Related to Storm Water

- **Cerro Grande Fire**

- May 2000
- 48,000 acres
- Increased flooding concerns
- Increased sediment transport concerns
- Flood Controls





# Recent History and Subsequent Responses Related to Storm Water

- **Las Conchas Fire**

- June 2011
- >150,000 acres
- Increased flooding concerns
- Watershed/Boundary Controls
- Controls through watershed

- **September 2013 Rains**

- Sep 10 - 17
- 200% - 600% of normal precipitation for period





# Recent History and Subsequent Responses Related to Storm Water

- **September 2013 Rains**

- Sep 10 - 17
- 200% - 600% of normal precipitation for period



# Current Developing Approach to Storm Water Management

## Pueblo Canyon

- **September 2013 Rains**
  - Sep 10 - 17
  - 200% - 600% of normal precipitation for period
- **Energy Independence and Security Act**



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# Current Developing Approach to Storm Water Management

- Watershed Priority
- Primary Considerations
  - NEPA
  - Timeline
  - Not used to meet other regulatory program requirements

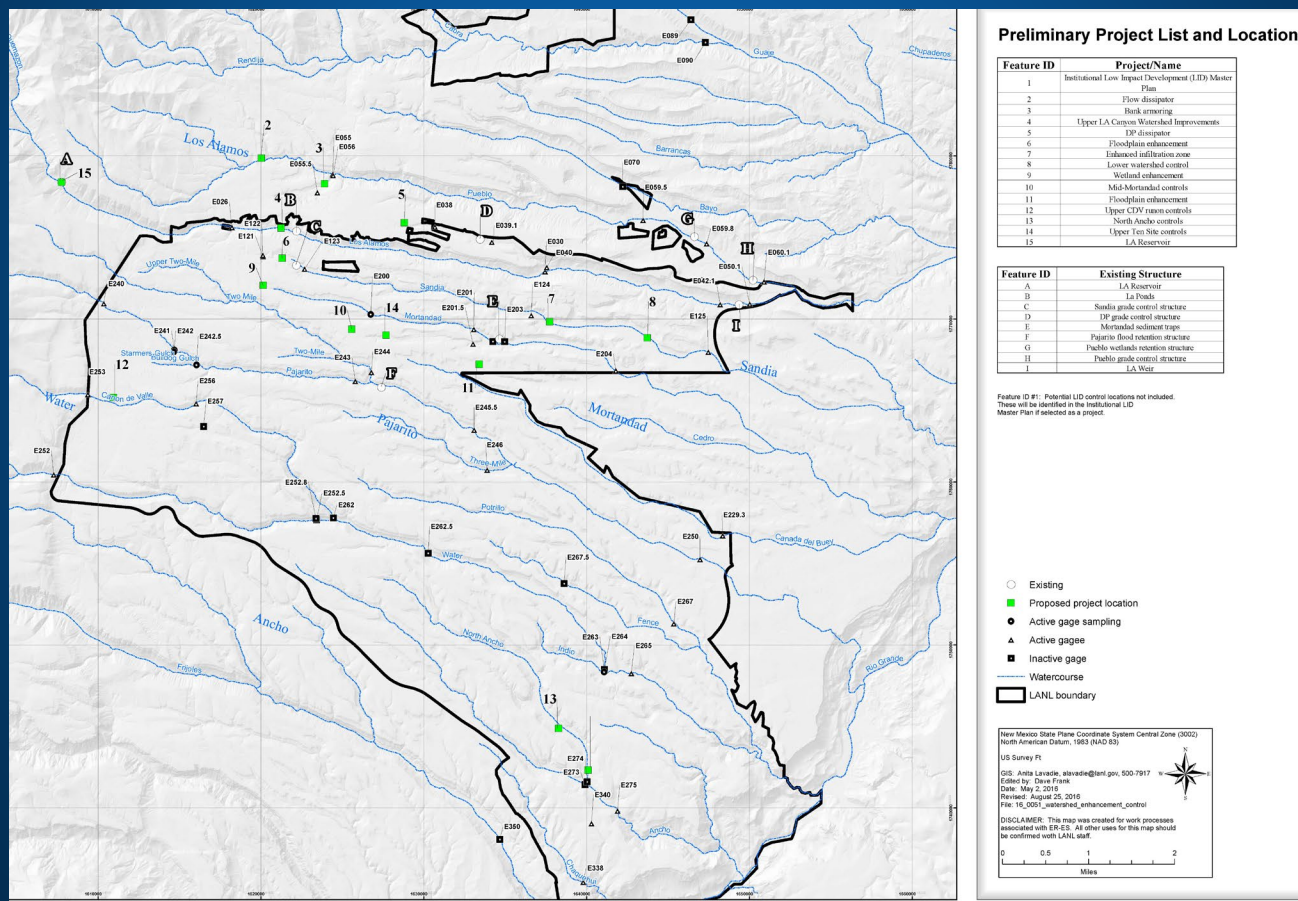
Flow Frequency/Discharge				
Pollutant Loading		Low	Moderate	High
	Low	Twomile Canyon Canada del Buey Ancho Canyon Chaquehui Canyon	Pajarito Canyon Water Canyon	
	Moderate	Potrillo Canyon Fence Canyon	Pueblo Canyon	DP Canyon Los Alamos Canyon Cañon de Valle
	High	Mortandad Canyon	Acid Canyon Sandia Canyon North Ancho Canyon	



# Current Developing Approach to Storm Water Management

## • Secondary Considerations

- Regulatory constraints for new subprojects
- Operations and maintenance requirements
- Public safety
- Full watershed approach
- Runoff potential and impervious surfaces
- Undesirable impacts to resources
- Maximum benefits to stakeholders and resources
- Rough Order of Magnitude Estimates/Available Funding



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# Current Developing Approach to Storm Water Management

- **Top of Watershed - Low Impact Development (LID)**

- Master Plan

- Develop overall site-specific appropriate concepts
    - Identify opportunities

- Standards

- Provides project management and design engineers
    - Selection criteria
    - Concept Information
    - Conflicts with traditional approach



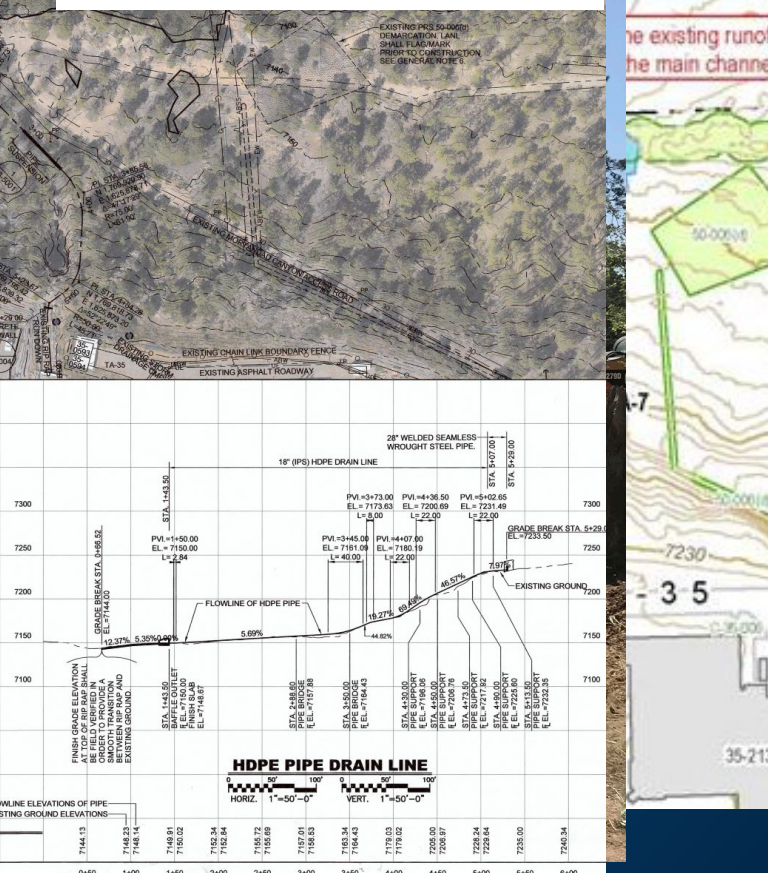
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## A topographic map segment showing contour lines. Two contour lines are labeled '7200'. The lines are brown and follow a wavy path across the map.

# Mid-Mortandad

- 



	0+50	1+00	1+50	2+00	2+50	3+00	3+50	4+00	4+50	5+00	5+50	6+00
Station	0+00	0+50	1+00	1+50	2+00	2+50	3+00	3+50	4+00	4+50	5+00	5+50
Station	6+00	6+50	7+00	7+50	8+00	8+50	9+00	9+50	10+00	10+50	11+00	11+50
Station	12+00	12+50	13+00	13+50	14+00	14+50	15+00	15+50	16+00	16+50	17+00	17+50
Station	18+00	18+50	19+00	19+50	20+00	20+50	21+00	21+50	22+00	22+50	23+00	23+50
Station	24+00	24+50	25+00	25+50	26+00	26+50	27+00	27+50	28+00	28+50	29+00	29+50
Station	30+00	30+50	31+00	31+50	32+00	32+50	33+00	33+50	34+00	34+50	35+00	35+50
Station	36+00	36+50	37+00	37+50	38+00	38+50	39+00	39+50	40+00	40+50	41+00	41+50
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Station	48+00	48+50	49+00	49+50	50+00	50+50	51+00	51+50	52+00	52+50	53+00	53+50
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Station	60+00	60+50	61+00	61+50	62+00	62+50	63+00	63+50	64+00	64+50	65+00	65+50
Station	66+00	66+50	67+00	67+50	68+00	68+50	69+00	69+50	70+00	70+50	71+00	71+50
Station	72+00	72+50	73+00	73+50	74+00	74+50	75+00	75+50	76+00	76+50	77+00	77+50
Station	78+00	78+50	79+00	79+50	80+00	80+50	81+00	81+50	82+00	82+50	83+00	83+50
Station	84+00	84+50	85+00	85+50	86+00	86+50	87+00	87+50	88+00	88+50	89+00	89+50
Station	90+00	90+50	91+00	91+50	92+00	92+50	93+00	93+50	94+00	94+50	95+00	95+50
Station	96+00	96+50	97+00	97+50	98+00	98+50	99+00	99+50	100+00	100+50	101+00	101+50
Station	102+00	102+50	103+00	103+50	104+00	104+50	105+00	105+50	106+00	106+50	107+00	107+50
Station	108+00	108+50	109+00	109+50	110+00	110+50	111+00	111+50	112+00	112+50	113+00	113+50
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Station	120+00	120+50	121+00	121+50	122+00	122+50	123+00	123+50	124+00	124+50	125+00	125+50
Station	126+00	126+50	127+00	127+50	128+00	128+50	129+00	129+50	130+00	130+50	131+00	131+50
Station	132+00	132+50	133+00	133+50	134+00	134+50	135+00	135+50	136+00	136+50	137+00	137+50
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Station	144+00	144+50	145+00	145+50	146+00	146+50	147+00	147+50	148+00	148+50	149+00	149+50
Station	150+00	150+50	151+00	151+50	152+00	152+50	153+00	153+50	154+00	154+50	155+00	155+50
Station	156+00	156+50	157+00	157+50								





**Watershed Analysis Overview**

Map showing the Upper Sandia and Lower Sandia watersheds, including subbasins, junctions, and flow paths. The map includes a scale bar (0 to 1 mile) and a north arrow.

**Legend:**

- Junction
- Subarea flow path (Transform)
- Paved road
- Herbageous
- Pinyon-Juniper
- Reach (Routing)
- Sandia subbasin
- Impervious Surface
- Western desert urban areas
- Reach segment
- Structures

**Subbasin Acreage:**

Subbasin	Acreage
1	134.52
2	48.17
3	19.9
4	3.76
5	18.78
6	21.87
7	2.69
8	25.68
9A	54.04
9B	52.6
10	55.75
11	25.68
12	24.85
13	252.33
14	99.29
15	65.68
16	242.52
17	16.86
18	5.4
19	39.53

**Map Details:**

- Upper Sandia and Lower Sandia subbasins are outlined in red.
- Flow paths are shown as blue dashed lines.
- Junctions are marked with yellow dots and labeled.
- Subbasins are numbered 1 through 19.
- Land use is color-coded: green for Pinyon-Juniper, yellow for Herbageous, light blue for Impervious Surface, and dark blue for Western desert urban areas.
- Structures are shown as black outlines.
- Paved roads are shown as red lines.
- Reaches are shown as blue solid lines.
- Reach segments are shown as blue dashed lines.

**Scale:** 0 to 1 mile.

**North Arrow:** Points North.

**Map Title:** Watershed Analysis Overview

**Map Date:** May 31, 2017

**Map File:** Map\_17\_0033\_Sandia\_Overview

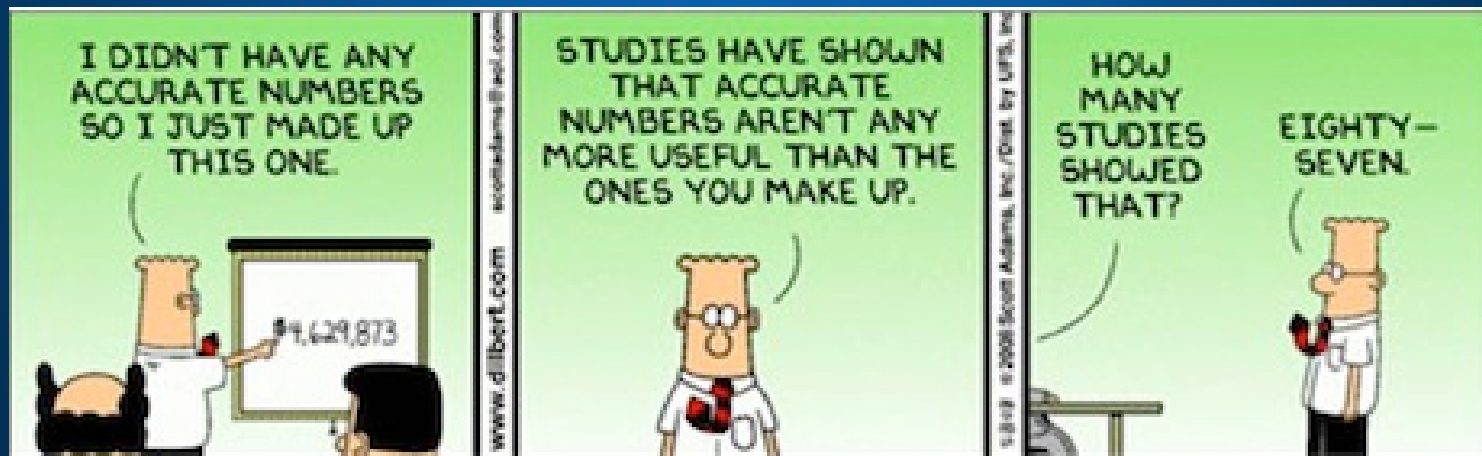
**Map Author:** Arila Lavaredo-Bulnes, lavaredo@lanl.gov

**Map License:** This map was created for work processes associated with ER-63. All other uses for this map should be confirmed with LANL staff.

# Watershed Case Study - Sandia

- **Evaluations**

- Upper Basin (control specific)
  - TR-55
  - SWMM
- Watershed Controls
  - HEC-HMS
  - HEC-RAS
  - Challenges





# Watershed Case Study - Sandia



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# Watershed Case Study - Sandia



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## Watershed Case Study - Sandia



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# QUESTIONS?